

PAPERS PRESENTED DURING 1921.

A Study of the Lucanid Coleoptera of the Hawaiian Islands.

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(Presented by title by W. M. Giffard at the meeting of
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In the year 1871, the first specimens of Hawaiian Lucanidae were secured by Mr. Harper Pease, from the "Mountains of Kanoi," and sent to the British Museum, where they were studied by Charles O. Waterhouse¹ and a new genus, *Aptero-cyclus*, with one species, *honoluluensis*, established for their reception. By the time the "Fauna Hawaiensis" was published, a few more specimens had been secured, chiefly by Mr. Perkins. These were studied by Dr. David Sharp² and, as several were found to differ considerably in structure from the species described and figured by Waterhouse, were described as new. This brought the number of known forms from the islands up to seven, where it has remained ever since. Within the last few years, however, a fairly large number of specimens has been collected, especially through the field work of Mr. J. August Kusche, who captured, in 1919, considerably over a hundred specimens in the uplands of the island of Kauai and of Mr. H. T. Osborn, who found about a dozen, at Puu Ka Pele, Kauai, the same year. A portion of the specimens collected by Mr. Kusche came to me through the courtesy of Mr. Preston Clark, of Boston. The remainder were secured by Mr. W. M. Giffard and the Bishop Museum, both of Honolulu. Mr. Osborn's specimens went to the collection of the Hawaiian Sugar Planters' Association.

As a result of an examination of my specimens, I soon found that our ideas with regard to the group needed revision. Mr. Giffard, who had been studying the specimens in the islands, came to the same conclusion and later on, finding that I had been devoting some time to their study, wrote to me and

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¹ Trans. Entom. Soc. London, 1871, p. 315.

² Fauna Hawaiensis, Vol. III, Pt. V, Coleoptera, pp. 403-405.

requested that I complete the work already begun. At the same time, he offered to have all of the specimens in Hawaiian collections shipped to me and generously placed all of his notes, dissections, and drawings at my disposal. All of this material is now before me as a result of this kind offer and of the assistance of Mr. Swezey, who shipped much of it.

The genus *Apteroocyclus* is peculiar in that it is wingless and without a labrum. It was stated by Waterhouse to be somewhat related to the Chilian genus *Sclerostomus*, but by Sharp supposed to be closer to the genus *Dorcus*, and to this latter view I agree. In fact, all specimens seen appear superficially like very degenerate and chubby species of *Dorcus*. Among the individuals of the genus there is also a very great amount of variation. I have had the opportunity to study one hundred and thirty-six specimens and as a result of this, supplemented by a careful examination of the dissections and drawings of the genitalia of numerous divergent forms, made by Mr. Giffard, have come to the conclusion that there is but one species, *honoluluensis*, and that all other so-called species are but variants of this. It seems to me that we have here a case of a species of *Dorcus* or of a closely related genus having become established at a very ancient time on what is now the island of Kauai, and of having undergone subsequent to that time a great degree of modification, chiefly along lines of degeneration. The species having once lost its stable status, soon acquired a great deal of plasticity which has been retained to the present date. The degeneration is shown in such ways as the absolute loss of wings and the resulting reduction of the entire afterbody, particularly evident in the shortening of the metathorax, as is clearly to be seen beneath in the very short metasternum, and the shortening and rounding of the elytra, a character that is always to be noted in species which have been long without wings; the loss of the labrum; and the shrinking of the integument, particularly noticeable in the elytra of the males. The species has undoubtedly developed its subterranean habits³ with the resulting enlargement of legs,

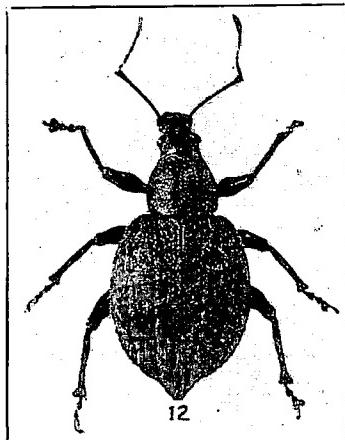
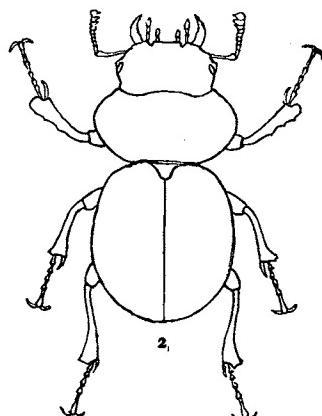
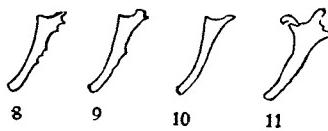
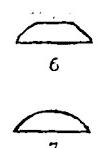
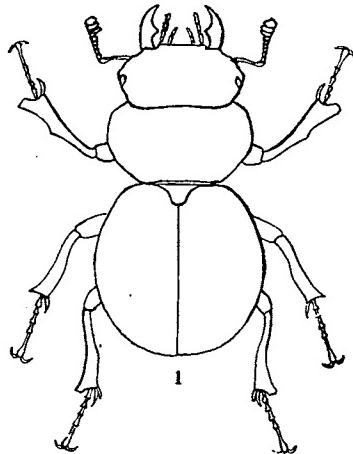
³ Mr. Kusche told me that he found practically all of his specimens in old rotting stumps or at the base of the same, and that sometimes they were some distance below the surface.

though there has been no appreciable reduction or other modification of the fore tarsi, as is so often found in fossorial Lamellicornia. The males show the usual Lucanid tendency to vary as regards the mandibles, the head, and prothorax; and the species as a whole, the tendency of lignivorous insects in general to vary greatly as to size. The largest males are fully 21 mm. in length from clypeus to apex of elytra and 11 mm. in greatest breadth, while the smallest specimen seen is hardly 12 mm. in length and 6 mm. in breadth.

The structures which I have found to be the most important from the standpoint of variability and useful as indices for my work, are the mandibles, the clypeus, the submentum (the mentum of earlier authors), the sides of the head, the fore tibia, and the scutellum, and to a lesser degree the middle and hind tibia. In no two specimens from the large number under observation, could I find all of the characters absolutely the same, though in the majority a certain proportion of the characters were alike. As regards the mandibles, there were found four main types: the first, the generalized and usual form with a moderately developed and acute tooth at about the middle, such as is shown in Plate I, fig. 1; second, a form with the tooth much more elongated and blunt at the tip and also projecting somewhat upwards as well as inwards, fig. 4; third, a form with greatly elongated, almost straight, and toothless mandibles, fig. 5; and fourth, a much reduced simple type of mandible with at most only a slight enlargement where the tooth should be, fig. 2. The first three forms are only found in the males and the last is restricted to the females. The clypeus shows that it may vary in three distinctive ways: have a transverse anterior margin, fig. 1; a pronounced bi-emarginate anterior margin, fig. 3; or be somewhat triangular with the middle much produced, fig. 5. The sides of the head are almost straight and parallel in a few, with the canthus not prominent and not impinging upon the anterior portion of the eye, fig. 3; somewhat rounded and with a well developed, more or less tuberculous canthus that decidedly overlaps the anterior margin of the eye, fig. 1; and quite oblique and converging anteriorly, with but a moderate development of the canthus, though with the same slightly im-

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Plate I.



Apterocyclus and Rhyncoconus.

pinging upon the eye, fig. 5. The anterior tibia may have the outer margin multidentate, fig. 8; may be somewhat simple in outline, fig. 10; or have the apex decidedly tripalmate, fig. 11. Composite types may also be found as in fig. 9. The scutellum is normally moderately prolonged and evenly rounded at the apex as shown in figs. 1 and 2, but in a few it is much shortened, greatly elongated and with parallel sides, or quite triangular and acute at the apex. The middle and posterior tibia may be simple and untoothed as with the majority, or provided with an acute tooth at about the middle as was no doubt the ancestral condition. Other characters are also variable, but they are of less value for purposes of differentiation. The male genitalia have been carefully studied by Mr. Giffard. I have critically examined the mounted dissections which he made from various forms, together with his drawings, and can find no differentiating characters of moment, though there were noted minor modifications. These latter, I believe, are mainly due to the changes which have been produced in the parts by mounting rather than to any material difference in the structures themselves. The male genitalia do, however, show distinctive generic characters. Plate II, which is made from one of Mr. Giffard's careful drawings, will give a good idea of the distinctive features, and enable anyone who wishes to contrast them with those found in other genera of the Lucanidae.

Studying the specimens themselves in regard to the struc-

EXPLANATION OF PLATE I.

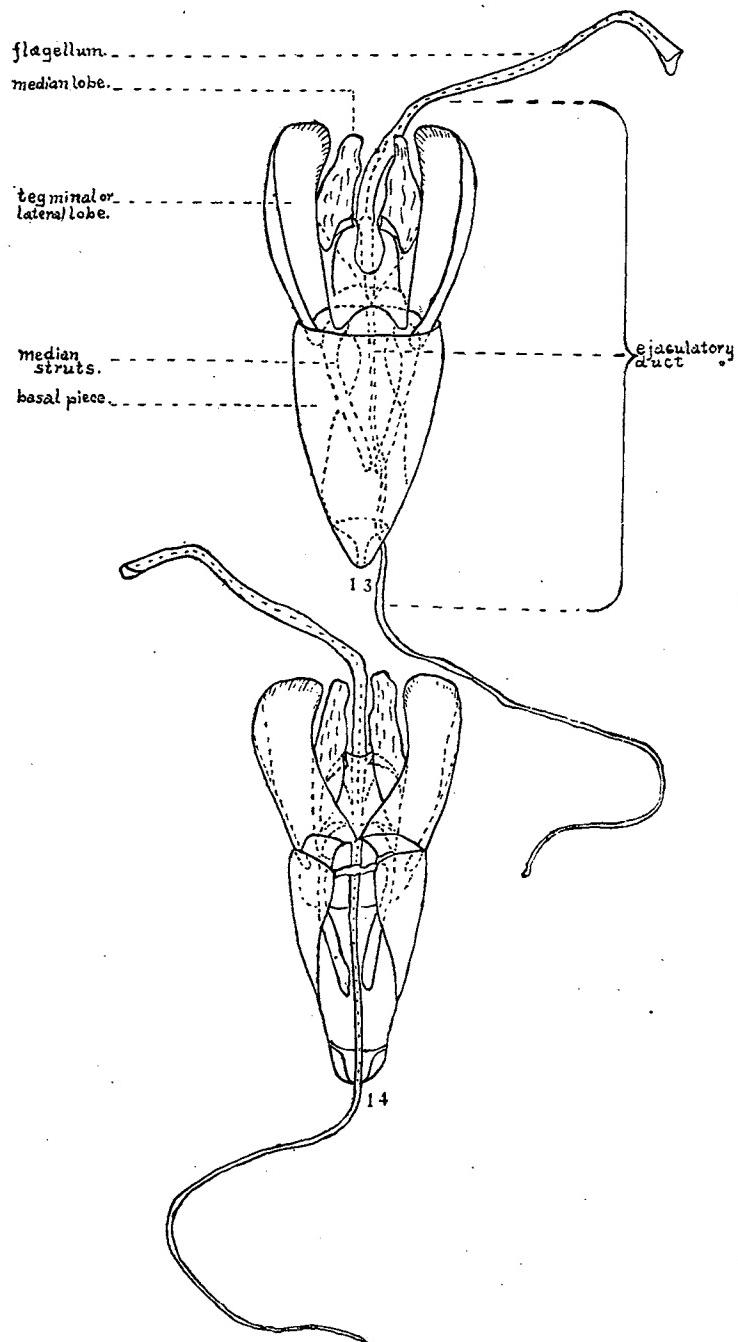
- Fig. 1, Male of *Apteroeyclus honoluluensis* Waterhouse (typical form).
- Fig. 2, Female of *Apteroeyclus honoluluensis* Waterhouse (typical form).
- Fig. 3, Head of *Apteroeyclus honoluluensis* var. *waterhousei* Sharp (typical).
- Fig. 4, Head of *Apteroeyclus honoluluensis* Waterhouse (atypical form).
- Fig. 5, Head of *Apteroeyclus honoluluensis* var. *palmatus* n. var.
- Fig. 6, Submentum, trapezoidal form.
- Fig. 7, Submentum, simple or arecuate form.
- Fig. 8, Fore tibia, the multidentate form.
- Fig. 9, Fore tibia, a composite form.
- Fig. 10, Fore tibia, a simple or reduced form.
- Fig. 11, Fore tibia, the tripalmate form.
- Fig. 12, *Rhyncogonus alternatus* n. sp.

tures indicated above, I found that they could readily be put into four main assemblies or groups. Three of these would include only males and the fourth only females. The three male types are sufficiently distinctive to be listed as varieties. The female type is fairly constant, the males less so, some being intermediates between two or more of the dominant types.

The members of the first group, I would in general characterize as being quite large and robust and with sides somewhat parallel; the head with moderately well developed and toothed mandibles, the clypeus bi-emarginate in front, and with the sides almost parallel and with the canthus but moderately developed and not or but slightly impinging upon the eye, fig. 3; a prothorax, large and with sides almost straight; the fore tibia large and multidentate on the outer margin; the middle and hind tibia each with a well developed and acute tooth near the middle, the scutellum of the normal type, fig. 1; and the submentum of the trapezoidal type, fig. 6. Two of the specimens before me are of this type, both collected by Mr. Kusche near the Waialae river, Kauai, and now belonging to Mr. Giffard. *Apterocyclus waterhousei* Sharp would also belong here. The elytra in this last are spinous at the sutural apex and the anterior margin of the clypeus somewhat truncate according to the illustration, but these are divergent and individual characters and of less value than are the characters which associate it with the others. The individuals of this group I would consider as most generalized and closest to the ancestral stock. The large size, more parallel form, smooth mahogany colored surface, and many toothed anterior tibiae, show that they have departed the least from their progenitors. The possession of wings and labrum and the general development which wings would require would make them almost typical species of *Dorcus*.

The second group, I would consider as including the specimens approximating the type of the genus, *Apterocyclus honoluluensis* Water., or like the one outlined in fig. 1. These would in general have moderately developed and toothed mandibles, the clypeus with a truncate or straight anterior margin, the head with the sides somewhat rounded though slightly angulated because of the development of the canthus, which

always impinges upon the eyes, a submentum with the anterior margin arcuate, fig. 7, a scutellum of the usual form, anterior tibia with only a single tooth at the middle, fig. 1, or even without, fig. 10, and middle and posterior in general without the lateral tooth. The beetles included here are the dominant forms. They are very dark, almost black, and in general quite opaque throughout, only a few showing on the head and prothorax the smoothness and mahogany color which is so characteristic of the females and of the members of the first group. These I would consider as having become most specialized along lines of degeneration. Among the members in this assembly will be seen the greatest amount of minor variations and signs of unstableness. The specimens as a whole show a great degree of reduction and simplification of structure as well as peculiar modifications and they vary also greatly in size, many of the less developed being much distorted and asymmetrical. The mandibles may be large or small, have a large tooth, fig. 4, or one much reduced but never absent, though the usual is with one of moderate size, fig. 1. In a few specimens the tooth is short and very broad at base, and in a number there is an additional but very small denticle not far from the apex of the mandible. The clypeus though generally straight along its anterior margin, may in some of the larger individuals show a bi-emarginate margin though never to such a marked degree as seen in group one, or a tendency toward the triangular shape so characteristic of the following group. In one or two of the more extreme phases, the margin is retracted and emarginate and in several almost evenly arcuate. The submentum is trapezoidal in a few of the larger specimens, though in the majority, simply arcuate, fig. 7. The sides of the head are, as a rule, as shown in fig. 1, though there is a great degree of variability as to the details of the outline, especially as to the prominence of the canthus and its relationship to the eye. The scutellum is generally normal, fig. 1, but in a few, great instability is shown by its assuming unusual shapes, as when the lobe becomes greatly elongated or quite triangular. The fore tibiae are, as indicated, in general quite simple as to the shaft but often variable as regards the apex. In the middle and hind tibiae, the shaft is usually



Male genitalia of *Apterocyclus*.

simple, though often definitely toothed. Most of the specimens seen came from an altitude of from three thousand to over four thousand feet, as from Kokee and Puu Ka Pele, on the island of Kauai, and were collected during May or June. I believe that from this group will develop the dominant and perhaps stable type of the future if the species persists. At present, however, there is great instability. Among the described forms I would assign to this group besides *Apteroeyclus honoluluensis* Water., previously mentioned, *A. munroi* Sharp, *A. adpropinquans* Sharp, *A. varians* Sharp, and *A. deceptor* Sharp, so-called species which are but slightly different, each in its own way, from the bulk of this group. If I were to name other new forms, basing them upon the same degrees of modification, noted for the above, I would need to designate at least fifty new forms, for, as I have previously stated, hardly any two specimens have the same structures modified in the same way and to the same degree.

The third group will include a number of individuals which are primarily characterized by being quite large, robust, and decidedly opaque. They have much elongated and untoothed mandibles, fig. 5, a triangular clypeus, and fore tibiae very robust and markedly tripalmate at the apex, fig. 11. In one specimen, the submentum is arcuate anteriorly, in the others, trapezoidal. In all other regards, they resemble the members of group two and show the same degree of variability as regards character. Five specimens of this phase are now before me, one belonging to the Bishop Museum, one to Mr. Giffard, and three to me, all collected by Mr. Kusche at an altitude of four thousand feet on the island of Kauai. This very distinct phase, I consider worthy of a name so will call it the variety *palmatus* n. var. and designate one of my specimens as the type, the other specimens as paratypes. It is a

EXPLANATION OF PLATE II.

Fig. 13, Male genitalia of *Apteroeyclus honoluluensis* Water., upper side.
Fig. 14, Male genitalia of *Apteroeyclus honoluluensis* Water., under side.

Figs. 13 and 14 are copied from drawings made by Mr. W. M. Giffard, and the parts are named according to the nomenclature of Sharp and Muir.

form which has become extremely modified along peculiar lines and seems to indicate that it is being adapted to a subterranean life. The long, almost straight, and porrect mandibles and heavy, fossorial anterior tibiae are such as one usually finds in insects leading a burrowing life.

The fourth group includes only females. Those which I have seen are of rather small size, averaging 18 mm. in length from clypeus to apex of elytra, are somewhat shining and of a rich mahogany color, have short and simple or untoothed mandibles, the clypeus with a straight anterior margin or merely indication of being bi-emarginate, a submentum that is more or less trapezoidal, and anterior tibiae that are always well developed apically and have a few lateral denticles, fig. 2. In two of the specimens under observation, the middle and posterior tibiae have a small tooth near the middle, but in the remainder the tibiae are simple. These females are also very hairy beneath, body as well as legs, and this degree of pilosity is never approached by any of the males. Seven specimens have been examined, one belonging to the Bishop Museum, one to the collection of the Hawaiian Sugar Planters' Association, one to Mr. Giffard, and four to me. The second specimen mentioned was captured by Mr. H. T. Osborn at Kokee, Kauai, June 11, 1919, and in company with eleven males of group two. The others were found by Mr. Kusche at an altitude of four thousand feet on Kauai, and in company with specimens of group three and a large series belonging to group two. The only other female that I know of is the one described as *Apterocyclus feminalis* Sharp which, according to the description and figure is not appreciably different from those seen by me.

Thus to sum up, I would state that, according to my judgment, there is but one species of the family Lucanidae in the Hawaiian Islands, *Apterocyclus honoluluensis* Waterhouse. The female of this, separately described as *Apterocyclus feminalis* Sharp, is readily separated from any of the males, by good characters, and is also fairly stable. The males, on the other hand, are markedly unstable and polymorphic, though as far as known examples show, they appear to be specialized in general in three ways: first, towards a retention of many of the primitive characteristics as is shown by members of the

first group, which might be designated by the name *waterhousei* Sharp and listed as a phase or variety of the species *honoluluensis* Water.; second, along lines of degeneration and simplification of structure, including all members of my second group, and to be designated as the typical form; and third, along lines of great modification as regards the mandibles and anterior tibiae, a result, I think, of becoming more adapted to a subterranean mode of life, producing a phase which I would designate as the phase or variety *palmatus* n. var.

For the opportunity to study this most interesting group of beetles I must thank the following good friends: Mr. W. M. Giffard, Mr. Preston Clark, and Mr. O. H. Swezey. Mr. Giffard in particular aided me in every way that was possible.

A New Species of *Rhyncogonus* (*Rhynchophorous*
Coleoptera), from the Island of Kauai,
Hawaiian Islands.

BY EDWIN C. VAN DYKE,

University of California, Berkeley, Cal.

(Presented by title by W. M. Giffard at the meeting of
December 1, 1921.)

Rhyncogonus alternatus n. sp.

Robust, very convex, blackish-brown, the tibiae and tarsi somewhat reddish; head with rostrum slightly longer than diameter across the eyes and coarsely, somewhat strigosely punctured above, the punctures of the front more rounded, and finer posteriorly, the surface sparsely clothed with light-brown hair, denser in the supraorbital region, the antennae with the first and second joints of the funiculus of about equal length; the prothorax broader than long, with sides almost parallel in basal half and slightly rounded and convergent anteriorly, the disc coarsely, cibrately, and irregularly punctured, with a smooth median longitudinal line, the surface sparsely pilose, like the head but with a tuft of lighter colored hair near the posterior angles; the elytra somewhat longer than broad and twice as broad as prothorax, very convex, even in the male, and with the carinate margin only evident near the humeri, the